Report Documentation Page

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The GeoPDF Project:
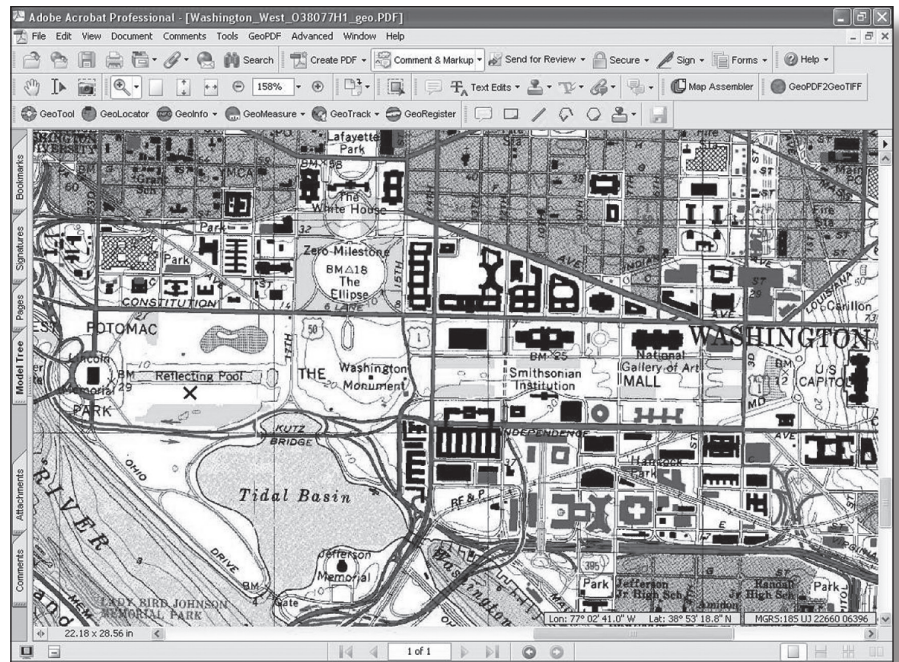# Creating Maps for the Non-Mapper

By Mr. Raymond G. Caputo

Organizations that use geospatial data have valuable information locked inside complex applications that only a small number of professionals understand and know how to use effectively. This poses a significant challenge to those attempting to transfer this information to less-skilled end users. United States Army operational and humanitarian missions rely heavily on such data, but many of its Soldiers do not have the time, training, or resources to translate it into actionable information. The United States Army Geospatial Center (AGC) (formerly known as the Topographic Engineering Center), Alexandria, Virginia, discovered and embraced an innovative means of converting complex, intricate National Geospatial–Intelligence Agency (NGA) and United States Geological Survey (USGS) geospatial information system (GIS) and map data into the portable document format (PDF) developed by Adobe® that lets users understand and exploit data without requiring advanced training in GIS applications.

A GeoPDF of the National Mall in Washington, D.C.

Easy Map Sharing

The Georeferenced PDF (GeoPDF), developed by TerraGo® Technologies, lets GIS professionals share georeferenced maps and data in PDF documents. A GeoPDF can be sent to field personnel from engineers on the scene of natural disasters such as Hurricane Katrina or to Soldiers in the field who can use Adobe Reader® to manipulate maps. Most computers are equipped with Reader as part of their baseline software, and each Army geospatial engineering team has the full assortment of TerraGo tools to produce mission-specific products as GeoPDFs. A free, user-friendly plug-in from TerraGo, known as the TerraGo Desktop, is the only requirement to view GeoPDFs. This plug-in has been added to the Army Golden Master disk, the standard software load for Army desktops and servers. Files are small and nimble, yet are embedded with powerful capabilities that allow engineers to work in connected or disconnected modes.

Both types of GeoPDFs, raster and vector, provide a scalable display of the digital map or image with crisp, clear delineation of roads, rivers, contour lines, and other features as the user zooms in for a closer look. The raster files are composed of paper maps that are scanned or developed from existing electronic map files saved as PDFs and georeferenced using the TerraGo Composer® solution. The vector files have an added function that enables users to turn data layers on or off to help clarify analysis of map displays. The use of TerraGo applications for GIS software, such as ArcGIS™ and Intergraph GeoMedia®, creates these vector GeoPDFs.

AGC created GeoPDF digital versatile discs (DVDs) for most countries of the world through its partnership with the NGA Research Center, which has produced GeoPDFs of most of its standard map sheets. AGC distributes these files, but is working on an agreement with NGA to produce, maintain, replicate, and disseminate them via the Defense Logistics Agency's map catalog. The center will continue to use Army resources to create new and updated NGA map sheets as GeoPDFs until this goal is accomplished. Updated DVDs are expected to be made available by fall 2010. For copies of GeoPDF country DVDs, go to <*http://www.agc.army.mil/cmb/index.html*> for the "Data request form." To see the GeoPDF map data that is the basis for the DVDs, go to <*https://cac.agc.army.mil/Products/MapArchive/*>

(common access card [CAC] required). AGC will create GeoPDF DVDs for all 50 states and work with USGS to maintain, replicate, and disseminate them.

Aiding Other Soldier Needs

While working with the Army geospatial engineering team, AGC personnel realized that GeoPDFs could address other facets of Soldier mapping efforts, including the creation of map backgrounds. This could be accomplished if more mainstream GIS software could read and write GeoPDFs and multiple sheets could be combined into a map background. Therefore, AGC funded the creation of a software application called TerraGo Map Assembler®, which is included in TerraGo Composer®, and the capability to view GeoPDFs in Environmental Systems Research Institute's™ ArcGIS™, which is included in TerraGo Publisher® for ArcGIS.

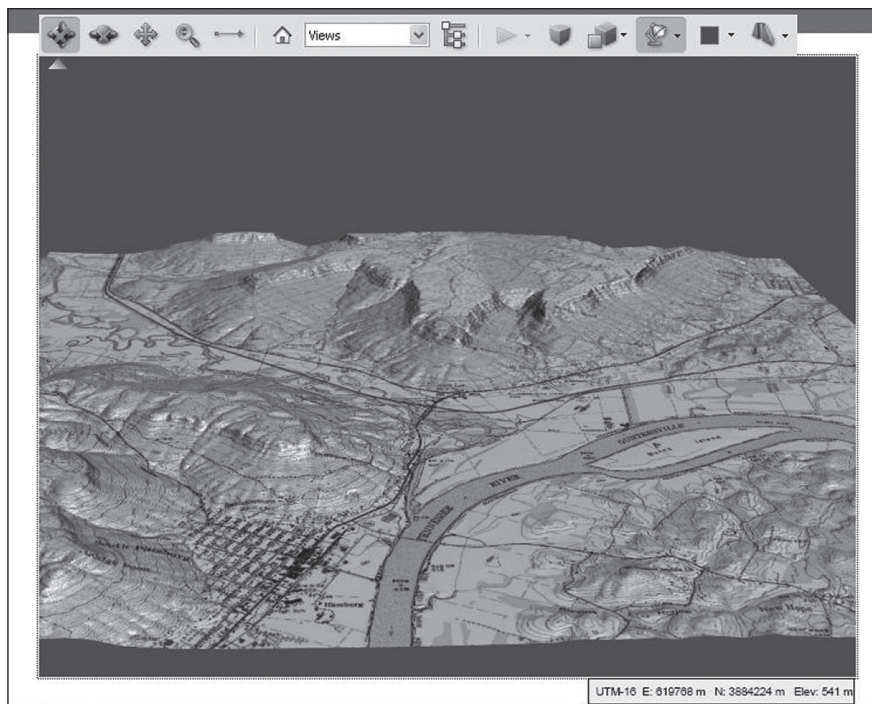**A GeoPDF of a three-dimensional map of the Tennessee River Valley**

AGC also had a hand in converting all the nearly 60,000 USGS Digital Raster Graphic GeoTIFF files (based on the tagged image file format) into GeoPDF using TerraGo Publisher for Raster. USGS posted the files on its store website, where an average of nearly 250,000 GeoPDF files have been downloaded each month, compared to the 4,000 monthly downloads before the availability of GeoPDFs.

AGC will convert all NGA's Arc Digital Raster Graphics (ADRGs) into GeoPDFs. ADRG covers most the world at different scales—1:1,000,000 scale for most of the world, down to 1:25,000 for small areas around the globe. ADRG is the basis for NGA's creation of the Compressed Arc Digital Raster Graphics (CADRG). AGC is also working with NGA to get all of NGA's geospatial intelligence products (maps, charts, and images) into GeoPDFs and to update current files to support the import and export of geospatial data with Reader for data exchange, or round-tripping as it is called by Adobe. It has also developed its Urban Tactical Planner™ (UTP) in GeoPDFs, along with engineering route studies, urban water graphics, country overviews, GeoPDF BuckEye map books, cultural maps, and the AGC library's non-NGA maps and atlases.

GeoPDFs Available at Websites

AGC also disseminates GeoPDFs via its websites. The following were recently added to its GeoPDF webpages:

- Unclassified Haiti GeoPDF country coverage and miscellaneous GeoPDFs of Haiti
- GeoPDF UTPs for Bolivia, Brazil, Colombia, Cuba, Haiti, Iran, Iraq, Morocco, Panama, Peru, and Somalia
- Country overviews for Benin, Bissau, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Haiti, Liberia, Mauritania, Namibia, Senegal, Sierra Leone, Tunisia, Western Sahara, and Yemen
- Camp Swift, Texas
- NGA image base maps of Mexico

AGC continues to work with TerraGo Technologies to ensure that its handheld Windows® Mobile GeoPDF software meets Army requirements. The center is also assisting TerraGo Technologies in its efforts to market a three-dimensional GeoPDF prototype.

GeoPDF data sets are available at the following websites:

- PKI (common access card required): *<https://tsunami.tec.army.mil/Products/MapArchive/>*
- SIPRNET: *<www.agc.army.smil.mil/Products/MapArchive/>*
- JWICS: *<http://www.agc.army.ic.gov/Products/MapArchive/>*

For more information about the Army GeoPDF program or to order copies of GeoPDF country DVDs, visit the websites above or contact the author at *<raymond.caputo@us.army.mil>*. Readers are also encouraged to contact Mr. Caputo if they know of any GeoPDFs being produced by other organizations.

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